CLAIMS

1. A process for preparing a coating fluid containing a polysiloxane, which comprises forming a reaction mixture comprising a silicon compound (A) of the formula (1):

$$Si(OR)_4 \qquad (1)$$

wherein R is a C_{1-5} alkyl group, a silicon compound (B) of the formula (2):

$$CF_3(CF_2)_nCH_2CH_2Si(OR^1)_3 \qquad (2)$$

wherein R^1 is a C_{1-5} alkyl group, and n is an integer of from 0 to 12, a silicon compound (C) of the formula (3):

$$H_2NCONH(CH)_mSi(OR^2)_3 \qquad (3)$$

wherein R^2 is a C_{1-5} alkyl group, and m is an integer of from 1 to 5, an alcohol (D) of the formula (4):

$$R^3CH_2OH \qquad (4)$$

wherein R^3 is a hydrogen atom or a C_{1-12} alkyl group (the alkyl group may optionally be substituted by one or more substituents of the same or different types selected from the group consisting of a C_{1-3} alkyl group, a C_{1-3} hydroxyalkyl group, a C_{2-6} alkoxyalkyl group, a C_{2-6} hydroxyalkoxyalkyl group and a C_{3-6} alkoxyalkoxyalkyl group), and oxalic acid (E), in a ratio of from 0.05 to 0.43 mol of the silicon compound (B) per mol of the silicon compound (A), in a ratio of from 0.01 to 0.20 mol of the silicon compound (C) per mol of the silicon compound (A), in a ratio of from 0.5 to 100 mol of the alcohol (D) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) and in a ratio

of 0.2 to 2 mol of the oxalic acid (E) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C), and heating this reaction mixture at a temperature of from 40 to 180°C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture becomes at most 5 mol%, while it is maintained at a SiO_2 concentration of from 0.5 to 10 wt% as calculated from silicon atoms in the reaction mixture and while absence of water is maintained.

2. The process for preparing a coating fluid according to Claim 1, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane, dodecyltriethoxysilane, hexadecyltrimethoxysilane, hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane, phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, γ-aminopropyltrimethoxysilane, γ-

aminopropyltriethoxysilane, γ-glycidoxypropyltrimethoxysilane, γ-glycidoxypropyltriethoxysilane, γ-methacryloxypropyltrimethoxysilane, γ-methacryloxypropyltriethoxysilane, dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a ratio of from 0.02 to 0.2 mol per mol of the silicon compound (A).

3. The process for preparing a coating fluid according to Claim 1 or 2, wherein at least one sol selected from the group consisting of silica sol, alumina sol, titania sol, zirconia sol, magnesium fluoride sol and ceria sol is further incorporated as an additive (G) to the coating fluid.

4. A process for forming a coating film, which comprises forming a reaction mixture comprising a silicon compound (A) of the formula (1):

$$Si(OR)_4 \qquad (1)$$

wherein R is a C_{1-5} alkyl group, a silicon compound (B) of the formula (2):

$$CF_3(CF_2)_nCH_2CH_2Si(OR^1)_3 \qquad (2)$$

wherein R^1 is a C_{1-5} alkyl group, and n is an integer of from 0 to 12, a silicon compound (C) of the formula (3):

$$H_2NCONH(CH)_mSi(OR^2)_3 \qquad (3)$$

wherein R^2 is a C_{1-5} alkyl group, and m is an integer of from 1 to 5, an alcohol (D) of the formula (4):

$$R^3CH_2OH \qquad (4)$$

wherein R^3 is a hydrogen atom or a C_{1-12} alkyl group (the alkyl group may optionally be substituted by one or more substituents of the same or different types selected from the group consisting of a C_{1-3} alkyl group, a C_{1-3} hydroxyalkyl group, a C_{2-6} alkoxyalkyl group, a C_{2-6} hydroxyalkoxyalkyl group and a C_{3-6} alkoxyalkoxyalkyl group), and oxalic acid (E), in a ratio of from 0.05 to 0.43 mol of the silicon compound (B) per mol of the silicon compound (A), in a ratio of from 0.01 to 0.20 mol of the silicon compound (C) per mol of the silicon compound (A), in a ratio of from 0.5 to 100 mol of the alcohol (D) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) and in a ratio of 0.2 to 2 mol of the oxalic acid (E) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C); heating this reaction mixture at a temperature of from 40 to 180°C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture becomes at most 5 mol%, while it is maintained at a SiO_2 concentration of from 0.5 to 10 wt% as calculated from silicon atoms in the reaction mixture and while absence of water is maintained, to form a solution of a polysiloxane thereby formed; then applying a coating fluid comprising the polysiloxane solution on a substrate surface to form a coating; and heat-curing the coating at a temperature of from 40 to 450°C, to form a coating film having a refractive index of from 1.28 to

1.41 and a contact angle with water of from 90° to 115°, as adhered to the substrate surface.

5. The process for forming a coating film according to Claim 4, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane, dodecyltriethoxysilane, hexadecyltrimethoxysilane, hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane, phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, γ-aminopropyltrimethoxysilane, γ-aminopropyltriethoxysilane, γ-glycidoxypropyltrimethoxysilane, γ-glycidoxypropyltriethoxysilane, γ-methacryloxypropyltrimethoxysilane, γ-methacryloxypropyltriethoxysilane, dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a ratio of from 0.02 to

0.2 mol per mol of the silicon compound (A).

6. The process for forming a coating film according to Claim 4 or 5, wherein at least one sol selected from the group consisting of silica sol, alumina sol, titania sol, zirconia sol, magnesium fluoride sol and ceria sol is further incorporated as an additive (G) to the coating fluid.

7. A coating film having a refractive index of from 1.28 to 1.41 and a contact angle with water of from 90° to 115°, which is formed as adhered to a substrate surface by forming a reaction mixture comprising a silicon compound (A) of the formula (1):

$$Si(OR)_4 \qquad (1)$$

wherein R is a C_{1-5} alkyl group, a silicon compound (B) of the formula (2):

$$CF_3(CF_2)_nCH_2CH_2Si(OR^1)_3 \qquad (2)$$

wherein R^1 is a C_{1-5} alkyl group, and n is an integer of from 0 to 12, a silicon compound (C) of the formula (3):

$$H_2NCONH(CH)_mSi(OR^2)_3 \qquad (3)$$

wherein R^2 is a C_{1-5} alkyl group, and m is an integer of from 1 to 5, an alcohol (D) of the formula (4):

$$R^3CH_2OH \qquad (4)$$

wherein R^3 is a hydrogen atom or a C_{1-12} alkyl group (the alkyl group may optionally be substituted by one or more substituents of the same or different types selected from the group consisting of a C_{1-3} alkyl group, a C_{1-3} hydroxyalkyl group, a C_{2-6} alkoxyalkyl group, a C_{2-6}

hydroxyalkoxyalkyl group and a C_{3-6} alkoxyalkoxyalkyl group), and oxalic acid (E), in a ratio of from 0.05 to 0.43 mol of the silicon compound (B) per mol of the silicon compound (A), in a ratio of from 0.01 to 0.20 mol of the silicon compound (C) per mol of the silicon compound (A), in a ratio of from 0.5 to 100 mol of the alcohol (D) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) and in a ratio of 0.2 to 2 mol of the oxalic acid (E) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C); heating this reaction mixture at a temperature of from 40 to 180°C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture becomes at most 5 mol%, while it is maintained at a SiO_2 concentration of from 0.5 to 10 wt% as calculated from silicon atoms in the reaction mixture and while absence of water is maintained, to form a solution of a polysiloxane thereby formed; then applying a coating fluid comprising the polysiloxane solution on a substrate surface to form a coating; and heat-curing the coating at a temperature of from 40 to 450°C.

8. The coating film according to Claim 7, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane,

ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane, dodecyltriethoxysilane, hexadecyltrimethoxysilane, hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane, phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, γ-aminopropyltrimethoxysilane, γ-aminopropyltriethoxysilane, γ-glycidoxypropyltrimethoxysilane, γ-glycidoxypropyltriethoxysilane, γ-methacryloxypropyltrimethoxysilane, γ-methacryloxypropyltriethoxysilane, dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a ratio of from 0.02 to 0.2 mol per mol of the silicon compound (A).

9. The coating film according to Claim 7 or 8, wherein at least one sol selected from the group consisting of silica sol, alumina sol, titania sol, zirconia sol, magnesium fluoride sol and ceria sol is further incorporated as an additive (G) to the coating fluid.

10. A process for forming a coating film, which comprises forming a reaction mixture comprising a silicon compound

(A) of the formula (1):

$$Si(OR)_4 \qquad (1)$$

wherein R is a C_{1-5} alkyl group, a silicon compound (B) of the formula (2):

$$CF_3(CF_2)_nCH_2CH_2Si(OR^1)_3 \qquad (2)$$

wherein R^1 is a C_{1-5} alkyl group, and n is an integer of from 0 to 12, a silicon compound (C) of the formula (3):

$$H_2NCONH(CH)_mSi(OR^2)_3 \qquad (3)$$

wherein R^2 is a C_{1-5} alkyl group, and m is an integer of from 1 to 5, an alcohol (D) of the formula (4):

$$R^3CH_2OH \qquad (4)$$

wherein R^3 is a hydrogen atom or a C_{1-12} alkyl group (the alkyl group may optionally be substituted by one or more substituents of the same or different types selected from the group consisting of a C_{1-3} alkyl group, a C_{1-3} hydroxyalkyl group, a C_{2-6} alkoxyalkyl group, a C_{2-6} hydroxyalkoxyalkyl group and a C_{3-6} alkoxyalkoxyalkyl group), and oxalic acid (E), in a ratio of from 0.05 to 0.43 mol of the silicon compound (B) per mol of the silicon compound (A), in a ratio of from 0.01 to 0.20 mol of the silicon compound (C) per mol of the silicon compound (A), in a ratio of from 0.5 to 100 mol of the alcohol (D) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) and in a ratio of 0.2 to 2 mol of the oxalic acid (E) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C); heating this reaction mixture at a

temperature of from 40 to 180°C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture becomes at most 5 mol%, while it is maintained at a SiO_2 concentration of from 0.5 to 10 wt% as calculated from silicon atoms in the reaction mixture and while absence of water is maintained, to form a solution of a polysiloxane thereby formed; then applying a coating fluid comprising the polysiloxane solution on a substrate surface to form a coating; drying the coating at a temperature of from 40 to 150°C and then aging the coating at a temperature of from 20 to 100°C for curing, to form a coating film having a refractive index of from 1.28 to 1.41 and a contact angle with water of from 90° to 115°, as adhered to the substrate surface.

11. The process for forming a coating film according to Claim 10, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane,

dodecyltriethoxysilane, hexadecyltrimethoxysilane, hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane, phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, γ-aminopropyltrimethoxysilane, γ-aminopropyltriethoxysilane, γ-glycidoxypropyltrimethoxysilane, γ-glycidoxypropyltriethoxysilane, γ-methacryloxypropyltrimethoxysilane, γ-methacryloxypropyltriethoxysilane, dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a ratio of from 0.02 to 0.2 mol per mol of the silicon compound (A).

12. The process for forming a coating film according to Claim 10 or 11, wherein at least one sol selected from the group consisting of silica sol, alumina sol, titania sol, zirconia sol, magnesium fluoride sol and ceria sol is further incorporated as an additive (G) to the coating fluid.

13. A coating film having a refractive index of from 1.28 to 1.41 and a contact angle with water of from 90° to 115°, which is formed as adhered to a substrate surface by forming a reaction mixture comprising a silicon compound (A) of the formula (1):

$$Si(OR)_4 \qquad (1)$$

wherein R is a C_{1-5} alkyl group, a silicon compound (B) of the formula (2):

$CF_3(CF_2)_nCH_2CH_2Si(OR^1)_3$ (2)

wherein R^1 is a C_{1-5} alkyl group, and n is an integer of from 0 to 12, a silicon compound (C) of the formula (3):

$H_2NCONH(CH)_mSi(OR^2)_3$ (3)

wherein R^2 is a C_{1-5} alkyl group, and m is an integer of from 1 to 5, an alcohol (D) of the formula (4):

R^3CH_2OH (4)

wherein R^3 is a hydrogen atom or a C_{1-12} alkyl group (the alkyl group may optionally be substituted by one or more substituents of the same or different types selected from the group consisting of a C_{1-3} alkyl group, a C_{1-3} hydroxyalkyl group, a C_{2-6} alkoxyalkyl group, a C_{2-6} hydroxyalkoxyalkyl group and a C_{3-6} alkoxyalkoxyalkyl group), and oxalic acid (E), in a ratio of from 0.05 to 0.43 mol of the silicon compound (B) per mol of the silicon compound (A), in a ratio of from 0.01 to 0.20 mol of the silicon compound (C) per mol of the silicon compound (A), in a ratio of from 0.5 to 100 mol of the alcohol (D) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) and in a ratio of 0.2 to 2 mol of the oxalic acid (E) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C); heating this reaction mixture at a temperature of from 40 to 180°C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture becomes at most 5 mol%, while it is maintained at a SiO_2 concentration of from 0.5 to 10 wt%

as calculated from silicon atoms in the reaction mixture and while absence of water is maintained, to form a solution of a polysiloxane thereby formed; then applying a coating fluid comprising the polysiloxane solution on a substrate surface to form a coating; drying the coating at a temperature of from 40 to 150°C and then aging the coating at a temperature of from 20 to 100°C for curing.

14. The coating film according to Claim 13, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane, dodecyltriethoxysilane, hexadecyltrimethoxysilane, hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane, phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, γ-aminopropyltrimethoxysilane, γ-aminopropyltriethoxysilane, γ-glycidoxypropyltrimethoxysilane, γ-

glycidoxypropyltriethoxysilane, γ-methacryloxypropyltrimethoxysilane, γ-methacryloxypropyltriethoxysilane, dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a ratio of from 0.02 to 0.2 mol per mol of the silicon compound (A).

15. The coating film according to Claim 13 or 14, wherein at least one sol selected from the group consisting of silica sol, alumina sol, titania sol, zirconia sol, magnesium fluoride sol and ceria sol is further incorporated as an additive (G) to the coating fluid.